BTeV raw data format – towards a proposal

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Context

- Serious DCB design is underway.
- A new round of trigger simulation is starting.
- All detector elements are well enough understood so that we can make intelligent decisions about data format.

Motivation

- Want a uniform format for data in the Level-1 buffers and at input to Level-2 trigger.
  - Want a simple format that will make debugging as easy as possible.
  - Want a flexible format that can evolve.

The heart of the proposal

- Pack all information into 16-bit words.
- Use 1 of 16 bits to distinguish between two types of words:
  - Data word
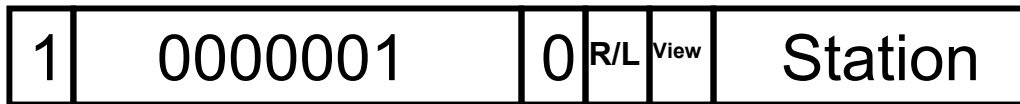 - Header or Trailer word

Some detail

- Header/trailer words have a "1" in the msb.
- Header/trailer words have a fixed length field that labels the type of word.
- Header/trailer words may contain information in the remaining bits.

- Data words have a "0" in the msb.
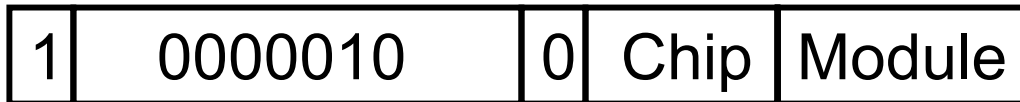
Example Header/Trailer Words

- Store #
- Run #
- Extended BCO #
- Word Count Record
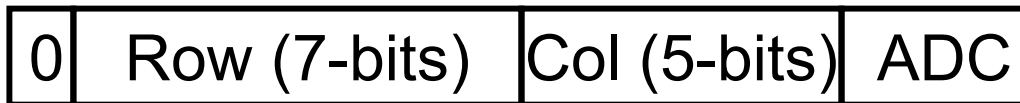- Pixel Half Plane ID
- Pixel Chip ID

More detail & examples

- Pixel data format proposed 4/28/03:

- Half-plane header:

1	0000001	0	R/L	View	Station

- Chip header:

1	0000010	0	Chip	Module

- Hit data:

0	Row (7-bits)	Col (5-bits)	ADC

Sample data stream

BCO header
BCO data…
Half plane header
Chip header
Hit data
Hit data…
Chip header
Hit data
Hit data… …
Half plane header
Chip header
Hit data… …
Pixel word count trailer
Word count (data)?
BCO header…

Features

- Simple; facilitates hardware debugging.
- Facilitates error detection (via word counts) & recovery.
- Merging data streams is trivial.
- Easy to add diagnostics or alarms to normal data stream if desired.

- Unnatural for floating point – does not accommodate IEEE floating point format.

A possible modification

- Define a procedure to suspend the format.
  - Escape the format **header**
  - Word count
  - Unformatted data…(32 or 64 bit IEEE floating point numbers, for example)
  - Re-enter the format **trailer**

My Hope

- Reach consensus in favor of the basic idea.

- Establish a small group to assign header/trailer word identifiers.

- Establish guidelines (or rules) for the use of word counts.

- Use this data format starting as close to the front-end modules as practical… maybe at the output of the DCB's.

Next Steps

- Do we need a series of meetings with one big group including representatives of each subdetector group as well as trigger & daq?

- Or maybe just trigger & daq?

- Then a presentation to the tech board?